Portability

Chapel Team, Cray Inc.

Chapel version 1.18

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Outline

- Chapel on Cray XC50 ARM Compute Nodes
- Improved CPU Counting
- User-Friendly Build Scripts

Chapel on Cray XC50 ARM Compute Nodes

Chapel on Cray XC50 ARM Compute Nodes

Background:

- Product adds Cavium ARM ThunderX2 processors to Cray XC50
  - Announced in November, 2017
- Native Chapel, not cross-compiled
- Previous release made Chapel build and run on XC50 ARM systems

This Effort:

- Shipped Chapel with the very first customer XC50 ARM system
- Updated target compiler interface
  - now optimizes for 64-bit ARM, Skylake, KNL
  - https://chapel-lang.org/docs/1.18/usingchapel/chplenv.html#chpl-target-arch
- Added full support for the Allinea target compiler on ARM systems
  - ARM's HPC C compiler
- Improved LLVM back-end support for ARM systems

Chapel on Cray XC50 ARM Compute Nodes

Impact:

- First new architecture to have Chapel from day one
- Users can use any of the target C compilers on the system

Status:

- Fully supported with the C back-end
- LLVM support passes all tests in release/examples
  - needs further ABI work to pass complete test suite

Next Steps:

- Improve LLVM back-end ABI compatibility with ARM
- Study and further optimize for ARM

Improved CPU Counting

Improved CPU Counting

Background: CPU counting on Linux had several flaws

- Based on system files, but didn't handle the full variety of their formats
- Result: internal errors, inappropriate amounts of parallelism

This Effort: Switch information sources and fix bugs

- Get CPU counts from hwloc when it is configured
- Absent hwloc, parse system files more robustly

Impact: CPU counting is more accurate and portable

- User bugs fixed
- While here: make Qthreads share runtime's hwloc topology instance

Next Steps: Nothing planned immediately

- Hwloc currently covers situations with known problematic file formats

User-Friendly Build Scripts

User-Friendly Build Scripts

Background: Building a Chapel Cray Module is not easy

- Current "legacy" build scripts are not very user-friendly:
  - Hard-wired for present-day Chapel Modules and Cray build machines
  - Not designed for non-core-team users
- It should be easier to build your own Chapel Cray Module from source
  - And customize it to meet local requirements

This Effort: "build_configs": All-new build scripts

- Much more flexible and user-friendly
- Example scripts that are easy to adapt to new requirements
  - One such example builds a customized Chapel Cray Module
- Supports future extensions for other package types
- Located in $CHPL_HOME/util/build_configs/

User-Friendly Build Scripts

Impact:

- Chapel Cray Modules can be built by non-core-team users
- Chapel can run on systems/configs not available to the core team

Status:

- Chapel 1.17.1 was recently built and installed on one such system
  - Stripped-down configuration; 3 runtime configs instead of 192
  - Successful proof-of-concept; may not be useful for production
- Soon after release 1.18.0, a “build_configs” dev version has successfully reproduced the standard Chapel Cray XC Module

Next Steps:

- Cray team to adopt “build_configs” for all Chapel Cray Modules
  - Testing needed to build confidence; time-consuming!
  - Lessons-learned improvements to be applied throughout build_configs

For More Information

For a more complete list of portability changes in the 1.18 release, refer to the ‘Portability’ and 'Packaging / Configuration Changes’ sections in the **CHANGES.md** file

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